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Experimental study on the effect of enclosures in heat transportation through forced convection

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Transportation of heat in the forced convection mode is investigated experimentally. The work broadly focusses on the subject of transported heat due to forced convection in interaction with an enclosure. The configuration is widely encountered in most of engineering and practical applications and establishments. Though, the heat transfer aspect had been widely studied and worked on in the last five decades however, the interaction of heat with an enclosure in different forms is an issue yet to be addressed. The present work specifically, details the effects of forced convection heat transfer in interaction with an enclosure which acts as a heat sink. The work is motivated by two reigning aspects of heat viz., conservation and transportation. The optimal condition for both the states is explored in low forced convection domain. Experiments on forced convective heat transportation are carried out over a square plate within a confinement (covered by glass plates from all sides except top and bottom). The results are analysed at varying orientations and along with the interaction of heat with enclosure. To understand the effect of enclosure, the location of enclosure at the end of confinement is systematically varied from fully enclosed configuration to the fully open configuration. Heat transfer is scrutinised for three different cases viz., fully closed exit, partially closed and totally open exit. The condition for optimal transportation of heat is detailed under varying conditions of orientations and enclosure placement. The heat transfer is understood from the analytically calculated value of heat transfer coefficient. The primary objective of the work is to investigate the condition for optimal heat transfer and to understand the role of key controlling parameters.

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